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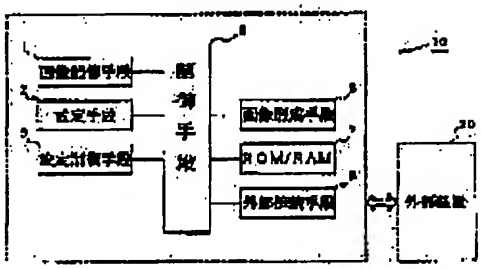
(54) IMAGE FORMATION DEVICE

(57)Abstract:

PURPOSE: To preserve a temporarily set optimum set value and to stably operate the device by providing an area for setting various conditions required for an SDRAM, and setting access from the outside to that area.

CONSTITUTION: At the time of writing, an address position to first write data, the number of clocks from the supply of address to the setting of writing data, length at the time of continuous access and the order of address changes at the time of continuous access or the like are set to a setting means 2 as set values and after the set values of the setting means 2 are reset to the prescribed internal register of the SDRAM at an image storage means 1 by a setting control means 3, writing is started. At the time of reading, similarly, reading is performed according to the contents of the setting means 2 by the setting control means 3 and based on read image information, image formation is performed by an image forming means 6. Thus, the optimum set values are temporarily written in the setting means 2 so that the SDRAM can be read/ written according to those set values anytime.



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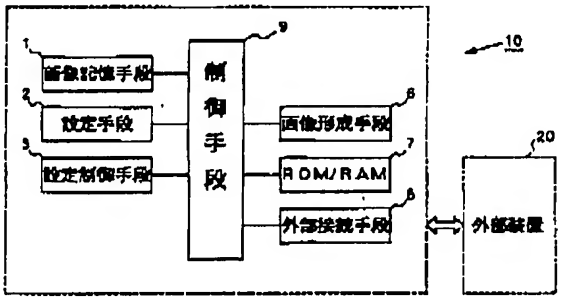
(54)【発明の名称】　画像形成装置

(57)【要約】
【目的】　ＳＤＲＡＭが必要とする設定値を外部から簡単に設定できるようにし、マイクロＣＰＵの動作周波数の変更に際して設定値を自動的に変更することにより、最適な設定値を簡単に設定し、しかも、ＳＤＲＡＭの種類の変更や、ＳＤＲＡＭの制御回路の変更を伴うことなく、一度設定した最適な設定値を保ち、安定に画像情報を処理する画像形成装置を提供する。
【構成】　画像情報を記憶するＳＤＲＡＭを備えた画像記憶手段１と、上記画像記憶手段１の読み書き時に、ＳＤＲＡＭが必要とする設定値を設定する設定手段２と、上記画像記憶手段１の読み書き時に、上記設定手段２に設定された内容に従って読み書きを制御する設定制御手段３を備える。



【特許請求の範囲】
【請求項１】　画像情報の記憶にＳＤＲＡＭを用いる画像形成装置において、画像情報を記憶するＳＤＲＡＭを備えた画像記憶手段と、上記画像記憶手段の読み書き時にＳＤＲＡＭが必要とする条件を設定する設定手段と、上記画像記憶手段の読み書き時に上記設定手段に設定された内容に従って読み書きを制御する設定制御手段とを備えたことを特徴とする画像形成装置。
【請求項２】　請求項１記載の画像形成装置において、上記設定手段の設定値を外部から設定する外部設定手段を備えたことを特徴とする画像形成装置。
【請求項３】　請求項１記載の画像形成装置において、上記設定手段が、画像形成装置内に置かれたＲＯＭであることを特徴とする画像形成装置。
【請求項４】　請求項１、請求項２、または、請求項３記載の画像形成装置において、上記画像記憶手段のＳＤＲＡＭに供給するクロック周波数が変更された場合、上記設定手段の設定値を、変更以前のクロック周波数との比率に基づいて、以前の設定値に最も近いクロックに該当するように設定値を変更する設定値変更手段を備えたことを特徴とする画像形成装置。
【発明の詳細な説明】
【０００１】
【産業上の利用分野】本発明は、電子写真複写機、プリンタ、ファックス等の画像形成装置において、画像情報を記憶するＳＤＲＡＭの制御に関するものである。
【０００２】
【従来の技術】従来、画像情報を記憶し、読み出して画像形成を行なう画像形成装置において、画像情報を高速で処理する場合はＳＲＡＭ（スタチック・ランダム・アクセス・メモリー）が、また大容量を必要とする場合はＤＲＡＭ（ダイナミック・ランダム・アクセス・メモリー）が一般に用いられていた。しかし、マイクロＣＰＵやプリンタの高速化と画像品質向上の要求から、近年より一層高速で、かつ、低コストにて大容量の画像情報用メモリーが必要となってきた。その要求を満たす方法として、近年、クロックに同期して動作するＳＤＲＡＭ（シンクロナス・ダイナミック・ランダム・アクセス・メモリー）が注目されるようになった。このＳＤＲＡＭは、データの読み書き迄の時間（クロック数）、連続アクセス時の長さ、連続アクセス時のアドレス等の必要な諸条件を読み書き時にその都度設定する面倒さがあった。特に、マイクロＣＰＵのクロックとＳＲＡＭのクロックを共用している場合には、マイクロＣＰＵの動作周波数に変更があった場合、ＳＤＲＡＭの種類の変更や、ＳＤＲＡＭの制御回路の変更が必要な場合があった。
【０００３】
【発明が解決しようとする課題】上記のように従来のＳＤＲＡＭを使用した画像形成装置においては、データの読み書き迄の時間（クロック数）、連続アクセス時の長さ、連続アクセス時のアドレス等の所要条件を読み書き時にその都度設定する面倒さがあった。特に、マイクロＣＰＵのクロックとＳＲＡＭのクロックを共用している場合には、マイクロＣＰＵの動作周波数に変更があった場合、ＳＤＲＡＭの種類の変更や、ＳＤＲＡＭの制御回路の変更が必要になるという不具合を生じていた。
【０００４】
【発明の目的】本発明は上述したような従来のＳＤＲＡＭを使用する画像形成装置の不具合を解消するためになされたものであって、ＳＤＲＡＭが必要とする諸条件を設定する領域を専用に設けることによって、外部からその領域に簡単にアクセス設定できるようにし、また、マイクロＣＰＵの動作周波数の変更に応じて設定値を自動的に変更することができ、しかも、ＳＤＲＡＭの種類の変更や、ＳＤＲＡＭの制御回路の変更を伴うことなく一度設定した最適な設定値を保存し、安定に動作するように構成した画像形成装置を提供することを目的としている。
【０００５】
【課題を解決するための手段】上記目的を達成するために、本発明では第一の手段として、画像情報の記憶にＳＤＲＡＭを用いる画像形成装置において、画像情報を記憶するＳＤＲＡＭを備えた画像記憶手段と、上記画像記憶手段の読み書き時にＳＤＲＡＭが必要とする条件を設定する設定手段と、上記画像記憶手段の読み書き時に上記設定手段に設定された内容に従って読み書きを制御する設定制御手段とを備えたことを特徴とする。
【０００６】第二の手段では、上記第一の手段の画像形成装置において、上記設定手段の設定値を外部から設定する外部設定手段を備えたことを特徴とする。
【０００７】更に本発明第三の手段では、上記第一の手段の画像形成装置において、上記設定手段が、画像形成装置内に置かれたＲＯＭであることを特徴とする。
【０００８】第四の手段においては、上記第一、第二、第三の手段の画像形成装置において、上記画像記憶手段のＳＤＲＡＭに供給するクロック周波数が変更された場合、上記設定手段の設定値を、変更以前のクロック周波数との比率に基づいて、以前の設定値に最も近いクロックに該当するように設定値を変更する設定値変更手段を備えたことを特徴とする。
【０００９】
【作用】本発明は上述したように、第一の手段として、画像情報の記憶にＳＤＲＡＭを用いる画像形成装置において、画像情報を記憶するＳＤＲＡＭを備えた画像記憶手段と、上記画像記憶手段の読み書き時にＳＤＲＡＭが必要とする条件を設定する設定手段と、上記画像記憶手段の読み書き時に上記設定手段に設定された内容に従って読み書きを制御する設定制御手段とを備えたので、ＳＤＲＡＭを動作させる最適な諸条件を設定手段により一度設定すれば、長期間にわたってその設定値を保存し、

その設定値に基づいて安定したＳＤＲＡＭへの書き込み、読み出しが可能となる。

【００１０】第二の手段では、上記第一の手段の画像形成装置において、上記設定手段の設定値を外部から設定する外部設定手段を備えたので、マイクロＣＰＵの動作周波数のが変更になってもＳＤＲＡＭの種類やＳＤＲＡＭの制御回路変更を行う必要がなく、しかも、外部から簡単に設定値を変更することができる。

【００１１】更に、本発明第三の手段では、上記第一の手段の画像形成装置において、上記設定手段が、画像形成装置内に置かれたＲＯＭであるので、マイクロＣＰＵのプログラムが格納されたＲＯＭを共用することができる。

【００１２】第四の手段においては、上記第一、第二、または第三の手段の画像形成装置において、上記画像記憶手段のＳＤＲＡＭに供給するクロック周波数が変更された場合、上記設定手段の設定値を、変更以前のクロック周波数との比率に基づいて、以前の設定値に最も近いクロックに該当するように設定値を変更する設定値変更手段を備えたので、ＳＤＲＡＭのクロック周波数が変更されても、自動的に最適な設定条件が演算され、記憶保存される。

【００１３】

【実施例】以下、図示した実施例に基づいて本発明を詳細に説明する。図１は本発明の一実施例を示すプリンクの要部構成を示すブロック図である。なお、この例には画像形成装置としてプリンタを例示するが、本発明は他の画像形成装置にも広く適用可能である。この例に示すプリンタは、画像記憶手段１と、上記画像記憶手段の動作に必要な条件を設定する設定手段２と、上記設定手段を制御する設定制御手段３と、画像形成装置６と、記憶装置ＲＯＭ／ＲＡＭ７と、外部接続手段８とが全体の制御手段９を介して接続されている。なお、２０は外部装置であって、上記画像形成装置に画像データを供給する機能をもったものである。

【００１４】この構成において動作及び各部の機能を説明する。

【００１５】図１に示す構成において、例えばコンピュータのような外部装置２０から画像情報が画像形成装置１０の外部接続手段８を経由して供給される場合を想定する。近年の高速処理が可能なコンピュータに対応するため、画像形成装置における画像記憶手段は上述したように高速で、しかも大容量のメモリーであって、同時に高速クロック信号に同期して動作するＳＤＲＡＭ（シンクロナス・ダイナミック・ランダム・アクセス・メモリー）が用いられている。このＳＤＲＡＭは、バースト・リード（連続読み取り）時に、最初の読み取り位置のアドレスを与えれば、設定された時間（図４のＣＡＳ Ｌａｔｅｎｃｙとして設定された時間を参照）後、最初のデータが出力され、その時点からクロック毎に設定された長さ分（Ｂｕｒｓｔ Ｌｅｎｇｔｈとして設定した長さ分）だけ、アドレス順番に読み取られたデータが出力される。また、バースト・ライト（連続書き込み）時についても同様に、最初に書き込む位置のアドレスを与え、かつ、クロック毎にライト・データを与えれば、設定により指示した長さ分だけアドレス順番に、連続書き込みが行われる。従来のＤＲＡＭ（ダイナミック・ランダム・アクセス・メモリー）のように、一つのデータ毎に常にアドレスを与えて読み書きする必要がないので、高速なデータ読み書きが可能である。

【００１６】また、外部接続手段８を介して受け取った画像情報を、上記画像記憶手段１のＳＤＲＡＭで高速に記憶し、あるいは読み出すには、最初に読み書きするアドレスの他、種々の設定値を与える必要がある。本発明では、その設定値を前以て用意するために設定手段２を設けている。この実施例では、設定制御手段３によって設定手段２に設定された内容に従って画像記憶手段１に対する読み書きを制御する場合を示している。このことを具体的に説明すると、書き込み時には最初に書き込むべきアドレス位置と、アドレスを供給した後書き込みデータを設定するまでのクロック数と、連続アクセス時の長さ及び連続アクセス時のアドレスの変化の順番等が、設定手段２に設定値として設定され、設定制御手段３によって設定手段２の設定値を画像記憶手段１のＳＤＲＡＭの所定の内部レジスターに再設定した後、書き込みを開始する。読み出しの時も同様に、設定制御手段３によって設定手段２の内容に従って読み出され、読み出された画像情報に基づいて画像形成手段６により画像形成される。制御手段９は一般にマイクロＣＰＵを備えており、画像形成装置１０の各手段間の情報伝達と、タイミングに合わせた動作指示を与え、あるいは各手段間が正常に動作しているか否かを監視する機能を有している。ＲＯＭ／ＲＡＭ７のＲＯＭには、マイクロＣＰＵを制御するプログラム等が格納されており、またＲＡＭは種々の計算結果を一時的に記憶するメモリとして用いられる。

【００１７】この構成によれば、ＳＤＲＡＭを動作させる最適な設定値を設定手段に一度書き込めれば、何時もその設定値に従ってＳＤＲＡＭの読み書きが可能となり、また、ＳＤＲＡＭに供給するクロックの周波数が変更になっても上記設定手段により設定値を変更するのみで済む。

【００１８】図２は本発明の変形実施例を示すブロック構成図であり、上記図１に説明した各機能のほか、更に、外部設定手段４と設定値変更手段５が追加されたものである。重複する説明は省略し、図１と異なる機能動作のみを説明する。即ち、ＳＤＲＡＭの設定値を設定する設定手段２としては、例えばディップスイッチ、ＲＡＭ、または、ＲＯＭが考えられるが、外部設定手段４は設定手段２の設定値内容を外部から設定、変更できるよ

うにするためのもので、例えば、画像形成装置１０の（図示省略）操作盤のキーから設定値を入力すると、外部設定手段４により内容を判断し、設定手段２のＲＡＭに書き込むことが可能となる。また更には、外部接続手段８を介して外部装置２０から設定値データを受け取る場合は、外部設定手段４で設定値内容を判断し、同様に設定手段２のＲＡＭに書き込むことも可能である。勿論、ディップスイッチを操作して設定値を定めることも可能である。

【００１９】以上のように、本実施例によれば、外部から設定手段２の設定値を設定することができるので、後述するようにマイクロＣＰＵの動作周波数の変更が生じても、ＳＤＲＡＭの種類やＳＤＲＡＭの制御回路の変更をすることなく、ＳＤＲＡＭの最適な設定値を外部設定手段から簡単に再設定することができる。

【００２０】また、上記実施例において上記設定手段２をＲＯＭにし、その一部を設定値を記憶しておく専用領域に設定しておいても良いが、コストメリットの点からマイクロＣＰＵのプログラムに使用するＲＯＭ／ＲＡＭ１０のＲＯＭ一部領域を流用する方法を用いれば、専用ＲＯＭを備える必要がなく、コスト低減に有利である。この場合には設定制御手段３によって、ＲＯＭ／ＲＡＭ１０のＲＯＭの中の所定領域に設定されているＳＤＲＡＭの設定値を検出し、その設定内容に従って画像記憶手段１の読み書きを制御する。

【００２１】また、ＳＤＲＡＭの大きな利点の一つとしてクロック信号に同期して動作する点が挙げられるが、一般にはＳＤＲＡＭのクロックとマイクロＣＰＵのクロックは共用して用いられるために、例えばマイクロＣＰＵの動作速度をアップするためにクロック周波数を高くすると、当然ＳＤＲＡＭの動作速度も早くなって、設定手段２に設定された低い周波数に対応する設定値では誤動作を生じることがある。例えば、ＳＤＲＡＭにアドレスを供給した後データの読み書き込みする間に他の処理を行なうための時間が確保されるようにクロック数を設定するが、クロックの周波数が変更されると、確保した時間に違いが生じる。このため他の必要な処理を行なうことができなくなり誤動作を起こすことがある。設定値変更手段５は、その誤動作を防止するために設置されたものであり、ＳＤＲＡＭに供給するクロック周波数が変更されても、クロック周波数の変更前後の変更比率を勘案して、ＳＤＲＡＭにアドレスを供給した後データの読み書き込みする間に他の処理を行なうための時間が確保されるようにクロック数を設定する。即ち、例えば、クロック周波数が二倍になった場合は、上記設定するクロック数を二倍する、ただし、クロック周波数の増大に伴って、他の処理に要する時間が短縮される場合は、その分クロック数を少なくする。このように、クロック周波数の変更に際して、設定時間に最も近い時間のクロックに該当するように設定値を変更する働きをするので、他の処理の時間は従来通り確保することができる。この機能を達成する方法の一つとして、図示を省略したが、設定値変更手段５の中にＳＤＲＡＭに供給するクロックより十分に高い周波数の基準クロック発生手段を備え、ＳＤＲＡＭのクロックの一周期が基準クロックのいくつ分に相当するか（例えば、この値をＢとする）を調べ、記憶しておく。クロック周波数が変更された場合、変更後のＳＤＲＡＭのクロックの一周期が基準クロックのいくつ分に相当するか（例えば、この値をＡとする）同様に検出し、変更以前のクロック周波数との比率（Ａ／Ｂ）を計算する。設定手段２の以前の設定値がｎの場合、新たな設定値はｎ×（Ａ／Ｂ）で計算された値以上の最も近い整数ｍを求め、設定値変更手段５により設定手段２の設定値ｎを設定値ｍに変更する。この方法によれば、ＳＤＲＡＭに供給するクロックの動作周波数が変っても、以前設定した時間を確保するように設定値も自動的に変更することができる。即ち、クロック周波数より十分高い周波数の第二のクロック信号によって、変更前後のクロック周波数をカウントし、その結果に基づいて、他の処理に必要な時間を確保するためのクロック数を算出すればよい。

【００２２】図３は、ＳＤＲＡＭの主要なタイミングを示したものである。図３に示す例では、ＳＤＲＡＭ内のモード・レジスタをセットするタイミングで、選択対象とするＳＤＲＡＭのＣＳ（チップ・セレクト）信号がアクテブ（Ｌｏｗ レベル）時であって、かつ、列（ロー）アドレス・ストローブのＲＡＳ信号がアクテブ時であり、同時に、行（カラム）アドレス・ストローブのＣＡＳ信号がアクテブ時で、書き込み可能（ライト・イネーブル）のＷＥ信号のアクテブ時に、通常はアドレス入力端子として用いている複数線で構成されているＲＡ信号に（図のＶａｌｉｄ部分）設定したい値を入力すれば良い。

【００２３】図４は、他のＳＤＲＡＭの主要なタイミング例を示したもので、ＳＤＲＡＭに最初の読み取り位置のアドレスを与え（図のＲＡ信号のＲｏｗ、Ｃｏｌｕｍと記した位置）、ＣＡＳ Ｌａｔｅｎｃｙとして設定された時間後、最初のデータが出力されるタイミングを示した図である。この例では、ＲＡＳ信号のアクテブ時にＲＡ信号上に列（ロー）アドレスを与え、ＣＡＳ信号のアクテブ時にＲＡ信号上に行（カラム）アドレスを与える。ＷＥ信号はハイレベルなので読み取り状態であり、列（ロー）と行（カラム）アドレスが８個目のクロック信号（図中の、ＳＹＳＣＬＫ信号）の立上りで整えられると、ＣＡＳ Ｌａｔｅｎｃｙ＝２と設定されているので、１０個目のクロック信号の立上りで最初のデータが成立する（図中の、Ｄ０）。以後、クロック毎にＤ１、Ｄ２、…とデータが出力される。従って、ＳＤＲＡＭに供給するクロック（ＳＹＳＣＬＫ信号）周波数が変更されると、ＣＡＳ Ｌａｔｅｎｃｙ＝２の設定のままで

は、ＣＡＳ Ｌａｔｅｎｃｙの時間ｔ１が変化する。変更後のクロック周波数が高くなればＣＡＳ Ｌａｔｅｎｃｙの時間はｔ１より短く、変更後のクロック周波数が低くなればＣＡＳ Ｌａｔｅｎｃｙの時間はｔ１より長くなる。若し、変更前の時間ｔ１の間に他の処理を行なう必要ある場合には、変更後のクロック周波数が高くなれば新たなＣＡＳＬａｔｅｎｃｙの時間内に他の処理を行なうことができなくなることが生じ、変更後のクロック周波数が低くなれば他の処理を行なった後時間的に余裕が生じ、処理時間が長くなると云う不具合が起こる。図２の設定値変更手段５は以上の不具合を解消するために設けられたもので、上述した方法によって、自動的に必要最小限の時間を設定するように構成したものである。

【００２４】

【発明の効果】以上説明したように本発明によれば、第一の手段では、設定手段の内容に従って読み書きを制御する設定制御手段を備えたので、ＳＤＲＡＭを動作させる最適な設定値を設定手段に一度書き込めれば、その後設定値に従ってＳＤＲＡＭの読み書きが可能となり、しかもＳＤＲＡＭに供給するクロックの周波数が変更になっても、設定手段の設定値を変更するのみで安定した画像形成が可能となる画像形成装置を提供することができる。

【００２５】また、本発明の第二の手段では、外部設定手段により、上記設定手段の設定値を設定できるので、マイクロＣＰＵの動作周波数が変更された場合であっても、ＳＤＲＡＭの種類やＳＤＲＡＭの制御回路の変更を伴うことなく、ＳＤＲＡＭの最適な設定値を簡単に再設定することができる。

【００２６】更に、本発明の第三の手段によれば、上記設定手段として画像形成装置内に備えたＲＯＭ領域に設定したので、マイクロＣＰＵのプログラムが入っているＲＯＭの中に共有してＳＤＲＡＭの設定値を入れることができ、特別にスイッチ類を設けることがなく、コストアップを伴うことなく簡単にＳＤＲＡＭの設定値を設定できる。

【００２７】また、本発明の第四の手段によれば、上記１、２、または、３の手段の画像形成装置において、ＳＤＲＡＭに供給するクロック周波数が変更された場合であっても、自動的に一度設定した最適なタイミング条件に一致する設定値に変更されるので、マイクロＣＰＵの動作周波数の変更に際して、ＳＤＲＡＭの種類の変更やＳＤＲＡＭの制御回路の変更をする必要がなく、しかも、一度設定した最適な設定値を自動的に保ち、安定に画像情報を処理する画像形成装置を提供することができる。

【図面の簡単な説明】

【図１】本発明の実施例を示す画像形成装置の要部のブロック図である。

【図２】本発明の実施例を示す他の画像形成装置の要部のブロック図である。

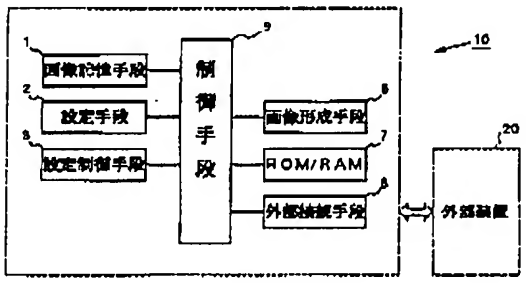
【図３】本発明の実施例で用いるＳＤＲＡＭの主要動作を示すタイミング図である。

【図４】本発明の実施例で用いるＳＤＲＡＭの主要動作を示す他のタイミング図である。

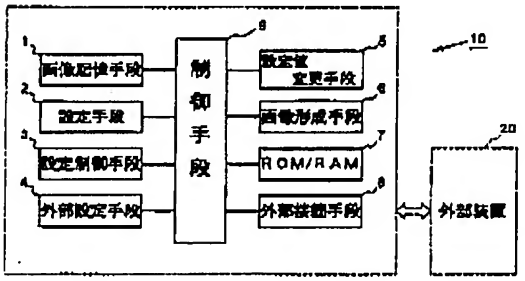
【符号の説明】

１・・・画像記憶手段、２・・・設定手段、３・・・設定制御手段、４・・・外部設定手段、５・・・設定値変更手段、６・・・画像形成手段、７・・・ＲＯＭ／ＲＡＭ、８・・・外部接続手段、９・・・制御手段、１０・・・画像形成装置、２０・・・外部装置。

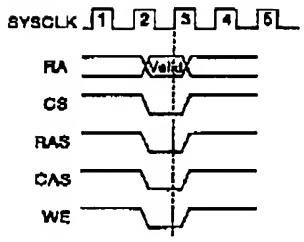
【図１】



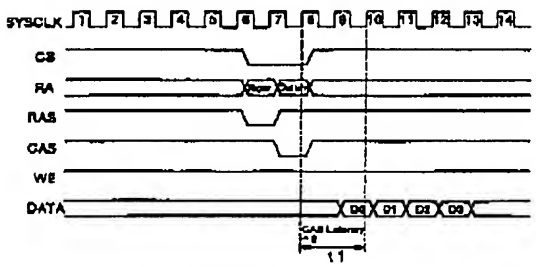
【図２】



【図３】



【図４】



フロントページの続き

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CLAIMS

[Claim(s)]
[Claim 1]An image forming device which uses SDRAM for memory of picture information, comprising:
An image storing means provided with SDRAM which memorizes picture information.
A setting-out means to set up conditions which SDRAM needs at the time of reading and writing of a described image memory measure.
A setting-out control means which controls reading and writing according to contents set as the above-mentioned setting-out means at the time of reading and writing of a described image memory measure.

[Claim 2]An image forming device having a remote setting means to set up a preset value of the above-mentioned setting-out means from the outside, in the image forming device according to claim 1.
[Claim 3]An image forming device characterized by the above-mentioned setting-out means being ROM placed into an image forming device in the image forming device according to claim 1.
[Claim 4]In claim 1, claim 2, or the image forming device according to claim 3, When a clock frequency supplied to SDRAM of a described image memory measure is changed, An image forming device provided with a preset value alteration means which changes a preset value so that a preset value of the above-mentioned setting-out means may be corresponded to a clock nearest to a former preset value based on a ratio with a clock frequency before change.

DETAILED DESCRIPTION

[Detailed Description of the Invention]

[0001]

[Industrial Application]This invention relates to control of SDRAM which memorizes picture information in image forming devices, such as an electro photography copying machine, a printer, and fax.

[0002]

[Description of the Prior Art]In the image forming device which memorizes picture information conventionally, begins to read and performs image formation, the case where picture information is processed at high speed -- SRAM (SUTACHIKKU random access memory) -- when you needed large scale, generally DRAM (dynamic random access memory) was used. However, from improvement in the speed of micro CPU or a printer, and the demand of the improvement in imaging quality, from recent years, it is a high speed much more, and the mass memory for picture information has been needed in low cost. As a method of filling the demand, SDRAM (synchronous dynamic random access memory) which operates synchronizing with a clock came to attract attention in recent years. This SDRAM had the trouble which sets up required terms and conditions, such as time (clock number) to reading and writing of data, length at the time of continuous access, and an address at the time of continuous access, each time at the time of reading and writing. When the clock of micro CPU and the clock of SRAM were being shared especially and there was change to the clock frequency of micro CPU, there was a case where the control circuit of SDRAM needed change of the kind of SDRAM and to be changed.

[0003]

[Problem(s) to be Solved by the Invention]In the image forming device which uses the conventional SDRAM as mentioned above, there was trouble which sets up necessary conditions, such as time (clock number) to reading and writing of data, length at the time of continuous access, and an address at the time of continuous access, each time at the time of reading and writing. When the clock of micro CPU and the clock of SRAM were being shared especially and there was change to the clock frequency of micro CPU, the fault that change of the kind of SDRAM and change of the control circuit of SDRAM were needed was produced.

[0004]

[Objects of the Invention]By making this invention in order to cancel the fault of the image forming device which uses the conventional SDRAM which was mentioned above, and providing the field which sets up the terms and conditions which SDRAM needs for exclusive use, An access set can be been made to carry out simply [the field] from the exterior, and a preset value can be automatically changed according to change of the clock frequency of micro CPU, And the optimal preset value set up once is saved without being accompanied by change of the kind of SDRAM, and change of the control circuit of SDRAM, and it aims at providing the image forming device constituted so that it might operate stably.

[0005]

[Means for Solving the Problem]This invention is characterized by that an image forming device which uses SDRAM for memory of picture information comprises the following as the first means by this invention to achieve the above objects.

An image storing means provided with SDRAM which memorizes picture information.

A setting-out means to set up conditions which SDRAM needs at the time of reading and writing of a described image memory measure.

A setting-out control means which controls reading and writing according to contents set as the above-mentioned setting-out means at the time of reading and writing of a described image memory measure.

[0006]In the second means, it had a remote setting means to set up a preset value of the above-mentioned setting-out means from the outside, in an image forming device of the first means of the above.

[0007]In the third means of this invention, the above-mentioned setting-out means is characterized by being ROM placed into an image forming device in an image forming device of the first means of the above.

[0008]On the fourth means and in an image forming device of the above-mentioned first and the second and third means, When a clock frequency supplied to SDRAM of a described image memory measure was changed, it had a preset value alteration means which changes a preset value so that a preset value of the above-mentioned setting-out means may be corresponded to a clock nearest to a former preset value based on a ratio with a clock frequency before change.

[0009]

[Function]In the image forming device which uses SDRAM for memory of picture information as the first means as this invention was mentioned above, The image storing means provided with SDRAM which memorizes picture information, and a

setting-out means to set up the conditions which SDRAM needs at the time of reading and writing of a described image memory measure, Since it had the setting-out control means which controls reading and writing according to the contents set as the above-mentioned setting-out means at the time of reading and writing of a described image memory measure, Once it sets up the optimal terms and conditions that operate SDRAM by a setting-out means, the preset value will be saved over a long period of time, and the writing to SDRAM stable based on the preset value and read-out will become possible.

[0010]Since it had a remote setting means to set up the preset value of the above-mentioned setting-out means from the outside, in the image forming device of the first means of the above in the second means, Even if that of the clock frequency of micro CPU is changed, it is not necessary to make a control circuit change of the kind of SDRAM, or SDRAM, and moreover, a preset value can be easily changed from the outside.

[0011]In the third means of this invention, in the image forming device of the first means of the above, since the above-mentioned setting-out means is ROM placed into the image forming device, ROM in which the program of micro CPU was stored can be shared.

[0012]On the fourth means and in the image forming device of the above-mentioned first and the second or third means, When the clock frequency supplied to SDRAM of a described image memory measure is changed, Since it had the preset value alteration means which changes a preset value so that the preset value of the above-mentioned setting-out means might be corresponded to the clock nearest to a former preset value based on a ratio with the clock frequency before change, Even if the clock frequency of SDRAM is changed, automatically, the optimal setups calculate and storage is carried out.

[0013]

[Example]Hereafter, based on the illustrated example, this invention is explained in detail. Drawing 1 is a block diagram showing the important section composition of the printer in which one example of this invention is shown. Although a printer is illustrated as an image forming device for this example, this invention is widely applicable to other image forming devices. A setting-out means 2 by which the printer shown in this example sets up conditions required for operation of the image storing means 1 and a described image memory measure, the setting-out control means 3 which controls the above-mentioned setting-out means, the image forming device 6, memory storage ROM/RAM7, and the external connection means 8 are connected via

the whole control means 9. 20 is an external device and has a function which supplies image data in a described image forming device.

[0014]Operation and the function of each part are explained in this composition.

[0015]In the composition shown in drawing 1, the case where picture information is supplied via the external connection means 8 of the image forming device 10 from the external device 20 like a computer is assumed. In order to correspond to the computer in which high speed processing in recent years is possible, the image storing means in an image forming device is a high speed as mentioned above, And it is a mass memory and SDRAM (synchronous dynamic random access memory) which operates simultaneously synchronizing with a high speed clock signal is used. If the address of the first read position is given at the time of burst read (continuation reading), this SDRAM, The first data is outputted after the set-up time (see the time set up as CAS Latency of drawing 4), and the data read in the time by address turn by the length set up for every clock (a part for the length set up as Burst Length) is outputted. If the address of the position written in first is similarly given about the time of a burst light (continuation writing) and right data are given for every clock, continuation writing will be carried out to address turn by the length to which it pointed by setting out. Like the conventional DRAM (dynamic random access memory), since need to give an address and it always is not necessary to write it for every data, high-speed data reading and writing are possible.

[0016]In order to memorize the picture information received via the external connection means 8 at high speed or to read it by SDRAM of the described image memory measure 1, it is necessary to give various preset values besides the address written first. In this invention, in order to prepare the preset value beforehand, the setting-out means 2 is formed. This example shows the case where the reading and writing to the image storing means 1 are controlled by the setting-out control means 3 according to the contents set as the setting-out means 2. The address position which should be first written in at the time of writing if this is explained concretely, A clock number until it sets up the postscript lump data which supplied the address, Writing is started, after the turn of change of the length at the time of continuous access and the address at the time of continuous access, etc. are set as the setting-out means 2 as a preset value and reset the preset value of the setting-out means 2 to the predetermined internal register of SDRAM of the image storing means 1 by the setting-out control means 3. Similarly, according to the contents of the setting-out means 2, it is read by the setting-out control means 3 also at the time of read-out, and image formation is carried out by the image forming means 6 based on the read

picture information. The control means 9 has a function which supervises whether it generally has micro CPU, and the signal transduction between each means of the image forming device 10 and the directions of operation doubled with timing are given, or between each means is operating normally. The program etc. which control micro CPU are stored in ROM of ROM/RAM7.
RAM is used as a memory which memorizes various calculation results temporarily.

[0017]What is necessary is just to change a preset value by the above-mentioned setting-out means, even if the frequency of the clock which the reading and writing of SDRAM of are always attained according to that preset value, and is supplied to SDRAM is changed once it can write the optimal preset value that operates SDRAM according to this composition in a setting-out means.
[0018]Drawing 2 is a block lineblock diagram showing the modification example of this invention, and the remote setting means 4 and the preset value alteration means 5 are further added for everything but each function that was explained to above-mentioned drawing 1. The overlapping explanation is omitted and only different functional operation from drawing 1 is explained. Namely, although a DIP switch, and RAM or ROM can be considered as a setting-out means 2 to set up the preset value of SDRAM, for example, It is for setting up the remote setting means 4 and changing the contents of a preset value of the setting-out means 2 from the outside, and if a preset value is inputted from the key of the distribution power board (graphic display abbreviation) of the image forming device 10, the contents will be judged by the remote setting means 4, and it will become possible to write in RAM of the setting-out means 2, for example. When receiving setting data from the external device 20 via the external connection means 8, it is also possible to judge the contents of a preset value by the remote setting means 4, and to write in RAM of the setting-out means 2 similarly. Of course, it is also possible to operate a DIP switch and to define a preset value.
[0019]As mentioned above, since the preset value of the setting-out means 2 can be set up from the exterior according to this example, The optimal preset value of SDRAM can be easily reset from a remote setting means, without changing the kind of SDRAM, and the control circuit of SDRAM, even if change of the clock frequency of micro CPU arises so that it may mention later.
[0020]Although the above-mentioned setting-out means 2 may be set to ROM in the above-mentioned example and the part may be set as the dedicated area which memorizes the preset value, If the method of diverting the ROM partial area of

ROM/RAM10 used for the program of micro CPU from a point of a cost merit is used, it is not necessary to have exclusive ROM and is advantageous to cost reduction. In this case, the preset value of SDRAM set as the predetermined region in ROM of ROM/RAM10 is detected, and reading and writing of the image storing means 1 are controlled by the setting-out control means 3 according to that setting detail.

[0021]Although the point of operating as one of the big advantages of SDRAM synchronizing with a clock signal is mentioned, Generally, since the clock of SDRAM and the clock of micro CPU are shared and used, For example, in order to raise the working speed of micro CPU, when a clock frequency is made high, naturally the working speed of SDRAM may also become early and malfunction may be produced in the preset value corresponding to the low frequency set as the setting-out means 2. For example, while data carries out a reading-and-writing lump after supplying an address to SDRAM, a clock number is set up so that the time for performing other processings may be secured, but if the frequency of a clock is changed, a difference will arise at the secured time. For this reason, it becomes impossible to perform other required processings, and malfunction may be caused. Even if the clock frequency which the preset value alteration means 5 is installed in order to prevent the malfunction, and is supplied to SDRAM is changed, The variation ratio before and behind change of a clock frequency is taken into consideration, and while data carries out a reading-and-writing lump after supplying an address to SDRAM, a clock number is set up so that the time for performing other processings may be secured. That is, however it, for example, doubles the above-mentioned clock number which sets up when a clock frequency becomes two times, when the time which other processings take is shortened with increase of a clock frequency, the part clock number is lessened. Thus, since it serves to change a preset value when changing a clock frequency so that it may correspond to the clock of the time nearest to a set period, the time of other processings is securable as usual. Although the graphic display was omitted as one of the methods which attains this function, It has a standard-of-frequency clock generating means higher enough than the clock supplied to SDRAM into the preset value alteration means 5, investigates whether a clock's of SDRAM round term is equivalent to a part for how many [of a reference clock] (for example, this value is set to B), and memorizes. When a clock frequency is changed, a clock's of SDRAM after change round term is equivalent to a part for how many [of a reference clock], or (for example, this value is set to A) it detects similarly, and a ratio (A/B) with the clock frequency before change is calculated. When the preset value before the setting-out means 2 is n, a new preset value searches for the nearest

integer m more than the value calculated by nx (A/B), and changes the preset value n of the setting-out means 2 into the preset value m by the preset value alteration means 5. According to this method, even if the clock frequency of the clock supplied to SDRAM changes, a preset value can also be automatically changed so that the time set up before may be secured. Namely, what is necessary is to count the clock frequency before and behind change, and just to compute the clock number for securing time required for other processings with the second clock signal of frequency sufficiently higher than a clock frequency, based on the result.

[0022]Drawing 3 shows the main timing of SDRAM. In the example shown in drawing 3, to the timing which sets the mode register in SDRAM. It is CS (chip select) signal of SDRAM made into a selection object at the active (Low level) time, And are a RAS signal of a sequence (low) address strobe at the active time, and the CAS signal of a line (column) address strobe simultaneously in the time of active. What is necessary is just to input a value (Valid portion of a figure) to set up into RA signal which comprises two or more lines usually used as an address input terminal at the time of active of WE signal [that it can write in (write enable)].

[0023]Drawing 4 is what showed the main examples of timing of other SDRAMs, and gives the address of the first read position to SDRAM (RA signal of a figure). [Row and] It is a figure showing the timing to which the first data is outputted after the position described as Colum, and the time set up as CAS Latency. In this example, a sequence (low) address is given on RA signal at the time of active of a RAS signal, and a line (column) address is given on RA signal at the time of active of a CAS signal. Since it is set to CAS Latency=2 if it is a read state and a sequence (low) and a line (column) address are prepared in the standup of the 8th clock signal (SYSCLK signal in a figure), since WE signal is high-level, The first data is materialized in the standup of the 10th clock signal (D0 in a figure). Henceforth, data is outputted with D1, D2, and -- for every clock. Therefore, change of the clock (SYSCLK signal) frequency supplied to SDRAM will change the time t1 of CAS Latency, while it has been setting out of CAS Latency=2. If the clock frequency after change becomes high, the time of CAS Latency is shorter than t1, and if the clock frequency after change becomes low, the time of CAS Latency will become longer than t1. other processings are performed between the time t1 before change -- required -- in a certain case. If the clock frequency after change becomes high, it will arise that it becomes impossible to perform other processings to within a time [of new CASLatency], if the clock frequency after change becomes low, after performing other processings, a margin arises in time, and the fault which says that processing time becomes long happens.

The preset value alteration means 5 of drawing 2 was established in order to cancel the above fault, and by the method mentioned above, it is constituted so that necessary minimum time may be set up automatically.

[0024]

[Effect of the Invention]As explained above, by this invention, it had the setting-out control means which controls reading and writing according to the contents of the setting-out means by the first means.

Therefore, once it can write the optimal preset value that operates SDRAM in a setting-out means, Even if reading and writing of SDRAM are attained according to a preset value after that and the frequency of the clock moreover supplied to SDRAM is changed, the image forming device whose image formation stable only by changing the preset value of a setting-out means becomes possible can be provided.

[0025]In the second means of this invention, by a remote setting means, since the preset value of the above-mentioned setting-out means can be set up, The optimal preset value of SDRAM can be reset easily, without being accompanied by change of the kind of SDRAM, or the control circuit of SDRAM, even if it is a case where the clock frequency of micro CPU is changed.

[0026]Since it was set as the ROM area which it had in the image forming device as the above-mentioned setting-out means according to the third means of this invention, It can share in ROM containing the program of micro CPU, the preset value of SDRAM can be put in, switches are not provided specially, and the preset value of SDRAM can be set up easily, without being accompanied by a cost hike.

[0027]According to the fourth means of this invention, the above 1 and 2, Or since it is changed into the preset value which is in agreement with the optimal timing condition set up once automatically even if it is a case where the clock frequency supplied to SDRAM is changed in the image forming device of the means of 3, It is necessary to change neither change of the kind of SDRAM, nor the control circuit of SDRAM, moreover, the optimal preset value set up once can be kept automatic when changing the clock frequency of micro CPU, and the image forming device which processes picture information stably can be provided.

[Translation done.]

TECHNICAL FIELD

[Industrial Application]This invention relates to control of SDRAM which memorizes picture information in image forming devices, such as an electro photography copying machine, a printer, and fax.

[Translation done.]

PRIOR ART

[Description of the Prior Art]In the image forming device which memorizes picture information conventionally, begins to read and performs image formation, the case where picture information is processed at high speed -- SRAM (SUTACHIKKU random access memory) -- when you needed large scale, generally DRAM (dynamic random access memory) was used. However, from improvement in the speed of micro CPU or a printer, and the demand of the improvement in imaging quality, from recent years, it is a high speed much more, and the mass memory for picture information has been needed in low cost. As a method of filling the demand, SDRAM (synchronous dynamic random access memory) which operates synchronizing with a clock came to attract attention in recent years. This SDRAM had the trouble which sets up required terms and conditions, such as time (clock number) to reading and writing of data, length at the time of continuous access, and an address at the time of continuous access, each time at the time of reading and writing. When the clock of micro CPU and the clock of SRAM were being shared especially and there was change to the clock frequency of micro CPU, there was a case where the control circuit of SDRAM needed change of the kind of SDRAM and to be changed.

[Translation done.]

EFFECT OF THE INVENTION

[Effect of the Invention]As explained above, by this invention, it had the setting-out control means which controls reading and writing according to the contents of the setting-out means by the first means.
Therefore, once it can write the optimal preset value that operates SDRAM in a setting-out means, Even if reading and writing of SDRAM are attained according to a preset value after that and the frequency of the clock moreover supplied to SDRAM is changed, the image forming device whose image formation stable only by changing the preset value of a setting-out means becomes possible can be provided.

[0025]In the second means of this invention, by a remote setting means, since the preset value of the above-mentioned setting-out means can be set up, The optimal preset value of SDRAM can be reset easily, without being accompanied by change of the kind of SDRAM, or the control circuit of SDRAM, even if it is a case where the clock frequency of micro CPU is changed.
[0026]Since it was set as the ROM area which it had in the image forming device as the above-mentioned setting-out means according to the third means of this invention, It can share in ROM containing the program of micro CPU, the preset value of SDRAM can be put in, switches are not provided specially, and the preset value of SDRAM can be set up easily, without being accompanied by a cost hike.
[0027]According to the fourth means of this invention, the above 1 and 2, Or since it is changed into the preset value which is in agreement with the optimal timing condition set up once automatically even if it is a case where the clock frequency supplied to SDRAM is changed in the image forming device of the means of 3, It is necessary to change neither change of the kind of SDRAM, nor the control circuit of SDRAM, moreover, the optimal preset value set up once can be kept automatic when changing the clock frequency of micro CPU, and the image forming device which processes picture information stably can be provided.

[Translation done.]

TECHNICAL PROBLEM

[Problem(s) to be Solved by the Invention]In the image forming device which uses the conventional SDRAM as mentioned above, there was trouble which sets up necessary conditions, such as time (clock number) to reading and writing of data, length at the time of continuous access, and an address at the time of continuous access, each time at the time of reading and writing. When the clock of micro CPU and the clock of SRAM were being shared especially and there was change to the clock frequency of micro CPU, the fault that change of the kind of SDRAM and change of the control circuit of SDRAM were needed was produced.

[0004]

[Objects of the Invention]By making this invention in order to cancel the fault of the image forming device which uses the conventional SDRAM which was mentioned above, and providing the field which sets up the terms and conditions which SDRAM needs for exclusive use, An access set can be been made to carry out simply [the field] from the exterior, and a preset value can be automatically changed according to change of the clock frequency of micro CPU, And the optimal preset value set up once is saved without being accompanied by change of the kind of SDRAM, and change of the control circuit of SDRAM, and it aims at providing the image forming device constituted so that it might operate stably.

[Translation done.]

MEANS

[Means for Solving the Problem]This invention is characterized by that an image forming device which uses SDRAM for memory of picture information comprises the following as the first means by this invention to achieve the above objects.

An image storing means provided with SDRAM which memorizes picture information.

A setting-out means to set up conditions which SDRAM needs at the time of reading and writing of a described image memory measure.

A setting-out control means which controls reading and writing according to contents set as the above-mentioned setting-out means at the time of reading and writing of a described image memory measure.

[0006]In the second means, it had a remote setting means to set up a preset value of the above-mentioned setting-out means from the outside, in an image forming device of the first means of the above.
[0007]In the third means of this invention, the above-mentioned setting-out means is characterized by being ROM placed into an image forming device in an image forming device of the first means of the above.
[0008]On the fourth means and in an image forming device of the above-mentioned first and the second and third means, When a clock frequency supplied to SDRAM of a described image memory measure was changed, it had a preset value alteration means which changes a preset value so that a preset value of the above-mentioned setting-out means may be corresponded to a clock nearest to a former preset value based on a ratio with a clock frequency before change.

[Translation done.]

[Translation done.]

OPERATION

[Function]In the image forming device which uses SDRAM for memory of picture information as the first means as this invention was mentioned above, The image storing means provided with SDRAM which memorizes picture information, and a setting-out means to set up the conditions which SDRAM needs at the time of reading and writing of a described image memory measure, Since it had the setting-out control means which controls reading and writing according to the contents set as the above-mentioned setting-out means at the time of reading and writing of a described image memory measure, Once it sets up the optimal terms and conditions that operate SDRAM by a setting-out means, the preset value will be saved over a long period of time, and the writing to SDRAM stable based on the preset value and read-out will become possible.
[0010]Since it had a remote setting means to set up the preset value of the

above-mentioned setting-out means from the outside, in the image forming device of the first means of the above in the second means, Even if that of the clock frequency of micro CPU is changed, it is not necessary to make a control circuit change of the kind of SDRAM, or SDRAM, and moreover, a preset value can be easily changed from the outside.

[0011]In the third means of this invention, in the image forming device of the first means of the above, since the above-mentioned setting-out means is ROM placed into the image forming device, ROM in which the program of micro CPU was stored can be shared.

[0012]On the fourth means and in the image forming device of the above-mentioned first and the second or third means, When the clock frequency supplied to SDRAM of a described image memory measure is changed, Since it had the preset value alteration means which changes a preset value so that the preset value of the above-mentioned setting-out means might be corresponded to the clock nearest to a former preset value based on a ratio with the clock frequency before change, Even if the clock frequency of SDRAM is changed, automatically, the optimal setups calculate and storage is carried out.

[Translation done.]

EXAMPLE

[Example]Hereafter, based on the illustrated example, this invention is explained in detail. Drawing 1 is a block diagram showing the important section composition of the printer in which one example of this invention is shown. Although a printer is illustrated as an image forming device for this example, this invention is widely applicable to other image forming devices. A setting-out means 2 by which the printer shown in this example sets up conditions required for operation of the image storing means 1 and a described image memory measure, the setting-out control means 3 which controls the above-mentioned setting-out means, the image forming device 6, memory storage ROM/RAM7, and the external connection means 8 are connected via the whole control means 9. 20 is an external device and has a function which supplies image data in a described image forming device.

[0014]Operation and the function of each part are explained in this composition.
[0015]In the composition shown in drawing 1, the case where picture information is supplied via the external connection means 8 of the image forming device 10 from the external device 20 like a computer is assumed. In order to correspond to the computer in which high speed processing in recent years is possible, the image storing means in an image forming device is a high speed as mentioned above, And it is a mass memory and SDRAM (synchronous dynamic random access memory) which operates simultaneously synchronizing with a high speed clock signal is used. If the address of the first read position is given at the time of burst read (continuation reading), this SDRAM, The first data is outputted after the set-up time (see the time set up as CAS Latency of drawing 4), and the data read in the time by address turn by the length set up for every clock (a part for the length set up as Burst Length) is outputted. If the address of the position written in first is similarly given about the time of a burst light (continuation writing) and right data are given for every clock, continuation writing will be carried out to address turn by the length to which it pointed by setting out. Like the conventional DRAM (dynamic random access memory), since need to give an address and it always is not necessary to write it for every data, high-speed data reading and writing are possible.
[0016]In order to memorize the picture information received via the external connection means 8 at high speed or to read it by SDRAM of the described image memory measure 1, it is necessary to give various preset values besides the address written first. In this invention, in order to prepare the preset value beforehand, the setting-out means 2 is formed. This example shows the case where the reading and writing to the image storing means 1 are controlled by the setting-out control means 3 according to the contents set as the setting-out means 2. The address position which should be first written in at the time of writing if this is explained concretely, A clock number until it sets up the postscript lump data which supplied the address, Writing is started, after the turn of change of the length at the time of continuous access and the address at the time of continuous access, etc. are set as the setting-out means 2 as a preset value and reset the preset value of the setting-out means 2 to the predetermined internal register of SDRAM of the image storing means 1 by the setting-out control means 3. Similarly, according to the contents of the setting-out means 2, it is read by the setting-out control means 3 also at the time of read-out, and image formation is carried out by the image forming means 6 based on the read picture information. The control means 9 has a function which supervises whether it generally has micro CPU, and the signal transduction between each means of the

image forming device 10 and the directions of operation doubled with timing are given, or between each means is operating normally. The program etc. which control micro CPU are stored in ROM of ROM/RAM7.
RAM is used as a memory which memorizes various calculation results temporarily.

[0017]What is necessary is just to change a preset value by the above-mentioned setting-out means, even if the frequency of the clock which the reading and writing of SDRAM of are always attained according to that preset value, and is supplied to SDRAM is changed once it can write the optimal preset value that operates SDRAM according to this composition in a setting-out means.
[0018]Drawing 2 is a block lineblock diagram showing the modification example of this invention, and the remote setting means 4 and the preset value alteration means 5 are further added for everything but each function that was explained to above-mentioned drawing 1. The overlapping explanation is omitted and only different functional operation from drawing 1 is explained. Namely, although a DIP switch, and RAM or ROM can be considered as a setting-out means 2 to set up the preset value of SDRAM, for example, It is for setting up the remote setting means 4 and changing the contents of a preset value of the setting-out means 2 from the outside, and if a preset value is inputted from the key of the distribution power board (graphic display abbreviation) of the image forming device 10, the contents will be judged by the remote setting means 4, and it will become possible to write in RAM of the setting-out means 2, for example. When receiving setting data from the external device 20 via the external connection means 8, it is also possible to judge the contents of a preset value by the remote setting means 4, and to write in RAM of the setting-out means 2 similarly. Of course, it is also possible to operate a DIP switch and to define a preset value.
[0019]As mentioned above, since the preset value of the setting-out means 2 can be set up from the exterior according to this example, The optimal preset value of SDRAM can be easily reset from a remote setting means, without changing the kind of SDRAM, and the control circuit of SDRAM, even if change of the clock frequency of micro CPU arises so that it may mention later.
[0020]Although the above-mentioned setting-out means 2 may be set to ROM in the above-mentioned example and the part may be set as the dedicated area which memorizes the preset value, If the method of diverting the ROM partial area of ROM/RAM10 used for the program of micro CPU from a point of a cost merit is used, it is not necessary to have exclusive ROM and is advantageous to cost reduction. In

this case, the preset value of SDRAM set as the predetermined region in ROM of ROM/RAM10 is detected, and reading and writing of the image storing means 1 are controlled by the setting-out control means 3 according to that setting detail.
[0021]Although the point of operating as one of the big advantages of SDRAM synchronizing with a clock signal is mentioned, Generally, since the clock of SDRAM and the clock of micro CPU are shared and used, For example, in order to raise the working speed of micro CPU, when a clock frequency is made high, naturally the working speed of SDRAM may also become early and malfunction may be produced in the preset value corresponding to the low frequency set as the setting-out means 2. For example, while data carries out a reading-and-writing lump after supplying an address to SDRAM, a clock number is set up so that the time for performing other processings may be secured, but if the frequency of a clock is changed, a difference will arise at the secured time. For this reason, it becomes impossible to perform other required processings, and malfunction may be caused. Even if the clock frequency which the preset value alteration means 5 is installed in order to prevent the malfunction, and is supplied to SDRAM is changed, The variation ratio before and behind change of a clock frequency is taken into consideration, and while data carries out a reading-and-writing lump after supplying an address to SDRAM, a clock number is set up so that the time for performing other processings may be secured. That is, however it, for example, doubles the above-mentioned clock number which sets up when a clock frequency becomes two times, when the time which other processings take is shortened with increase of a clock frequency, the part clock number is lessened. Thus, since it serves to change a preset value when changing a clock frequency so that it may correspond to the clock of the time nearest to a set period, the time of other processings is securable as usual. Although the graphic display was omitted as one of the methods which attains this function, It has a standard-of-frequency clock generating means higher enough than the clock supplied to SDRAM into the preset value alteration means 5, investigates whether a clock's of SDRAM round term is equivalent to a part for how many [of a reference clock] (for example, this value is set to B), and memorizes. When a clock frequency is changed, a clock's of SDRAM after change round term is equivalent to a part for how many [of a reference clock], or (for example, this value is set to A) it detects similarly, and a ratio (A/B) with the clock frequency before change is calculated. When the preset value before the setting-out means 2 is n, a new preset value searches for the nearest integer m more than the value calculated by nx (A/B), and changes the preset value n of the setting-out means 2 into the preset value m by the preset value alteration

means 5. According to this method, even if the clock frequency of the clock supplied to SDRAM changes, a preset value can also be automatically changed so that the time set up before may be secured. Namely, what is necessary is to count the clock frequency before and behind change, and just to compute the clock number for securing time required for other processings with the second clock signal of frequency sufficiently higher than a clock frequency, based on the result.

[0022]Drawing 3 shows the main timing of SDRAM. In the example shown in drawing 3, to the timing which sets the mode register in SDRAM. It is CS (chip select) signal of SDRAM made into a selection object at the active (Low level) time, And are a RAS signal of a sequence (low) address strobe at the active time, and the CAS signal of a line (column) address strobe simultaneously in the time of active. What is necessary is just to input a value (Valid portion of a figure) to set up into RA signal which comprises two or more lines usually used as an address input terminal at the time of active of WE signal [that it can write in (write enable)].

[0023]Drawing 4 is what showed the main examples of timing of other SDRAMs, and gives the address of the first read position to SDRAM (RA signal of a figure). [Row and] It is a figure showing the timing to which the first data is outputted after the position described as Colum, and the time set up as CAS Latency. In this example, a sequence (low) address is given on RA signal at the time of active of a RAS signal, and a line (column) address is given on RA signal at the time of active of a CAS signal. Since it is set to CAS Latency=2 if it is a read state and a sequence (low) and a line (column) address are prepared in the standup of the 8th clock signal (SYSCLK signal in a figure), since WE signal is high-level, The first data is materialized in the standup of the 10th clock signal (D0 in a figure). Henceforth, data is outputted with D1, D2, and -- for every clock. Therefore, change of the clock (SYSCLK signal) frequency supplied to SDRAM will change the time t1 of CAS Latency, while it has been setting out of CAS Latency=2. If the clock frequency after change becomes high, the time of CAS Latency is shorter than t1, and if the clock frequency after change becomes low, the time of CAS Latency will become longer than t1. other processings are performed between the time t1 before change -- required -- in a certain case. If the clock frequency after change becomes high, it will arise that it becomes impossible to perform other processings to within a time [of new CASLatency], if the clock frequency after change becomes low, after performing other processings, a margin arises in time, and the fault which says that processing time becomes long happens. The preset value alteration means 5 of drawing 2 was established in order to cancel the above fault, and by the method mentioned above, it is constituted so that

necessary minimum time may be set up automatically.

[Translation done.]

DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]
[Drawing 1]It is a block diagram of the important section of the image forming device in which the example of this invention is shown.
[Drawing 2]It is a block diagram of the important section of other image forming devices in which the example of this invention is shown.
[Drawing 3]It is a timing diagram showing the main operation of SDRAM used in the example of this invention.
[Drawing 4]They are other timing diagrams showing the main operation of SDRAM used in the example of this invention.
[Description of Notations]
1 [... A remote setting means, 5 / ... A preset value alteration means, 6 / ... An image forming means, 7 / ... ROM/RAM, 8 / ... An external connection means, 9 / ... A control means, 10 / ... An image forming device, 20 / ... External device.] ... An image storing means, 2 ... A setting-out means, 3 ... A setting-out control means, 4

[Translation done.]

e.]